Department of Environmental Conservation
Division of Water

Water Quality Standards Program

Elements of a Tier 2 Water Quality Monitoring Quality Assurance Project Plan (QAPP)

January 15, 2010

Table of Contents

Elements of a Tier 2 Water Monitoring Quality Assurance Project Plan (QAPP)

Suitability: for use in developing ACWA Grant, TMDL, Domestic Wastewater Permit and APDES and Compliance Monitoring QAPPs

A. Project Management Elements

l. Title and Approval Sheet - Includes the title of the plan, the name of the organization(s) implementing the project, and the effective date of the plan. It must have printed name, signature and date lines for the following individuals: overall Project Manager, Project QA Officer/Manager, DEC Project Manager, and the DEC Division of Water QA Officer

2. Table of Contents – Use the same numbering system as the EPA Quality Assurance Requirements document (**EPA QA/R-5**); i.e., A1, A2 etc. (Go to the end of this document for EPA QA/R-5 website) Whenever a section is not relevant to a specific project QAPP, N/A, can be typed in. Each page following the Title and Approval pages must show the name of the project, date and revision number at the top or bottom of the page and number of pages.

3. Distribution List (in table format) – Includes a list of the name, title, organization, phone number and email (postal mail addresses optional) of all who receive the approved QAPP and any subsequent revisions (e.g., Project Manager, Project QA Officer, DEC Project Manager, DEC QA Officer, Laboratory Project Manager or contact, lead field sampler(s), and others involved with the sampling as needed).

4. Project/Task Organization – This description (in table format) identifies the individuals/organizations participating in the project and discusses their specific roles and responsibilities. It includes the principal data users, the decision makers, the project QA officer and all those responsible for project implementation. A concise organization chart will be included independently showing:

1. Lines of Management Authority
2. Lines of Data Reporting Responsibility
3. Lines of Quality Assurance Authority and Responsibility (***note: project QA Officer authority/responsibility to be independent from direct supervision of project monitoring and laboratory operations by at least one level of supervision/management***).

This org. chart includes other data users outside of the organization generating data, such as for whom the data is intended (AWQMS, STORET, DROPS, ICIS-NPDES, etc). The org. chart also identifies any subcontractor relevant to environmental data operations, including laboratories providing analytical services.

5. Problem Definition/Background and Project Objective/s – State the specific problem to be solved, decision to be made, or outcome to be achieved. There should be sufficient background information to provide a historical, scientific, and regulatory perspective. State the reason (the project objective) for the work to be done. ***If previous monitoring data exists, briefly summarize results in table format, the respective numeric water quality pollutant***

standard/s (aquatic life fresh water, drinking water, water supply, etc) and how this data was used to reason the proposed monitoring plan.

6. Project/Task Description – This section provides a ***summary*** of all work to be performed, list of ***products*** to be produced, ***measurements to be taken***, and the ***schedule*** for implementation. This section will contain an introductory large scale map showing the overall geographic location/s of field tasks. This section should be short; save the total picture for B-1. Sampling Process Design.

Note: For GPS coordinates, use only the following format:
North Lattitude degrees (^{o}) minutes. decimal minutes
Longitude - degrees (^{o}) minutes.decimal minutes (longitude is always negative in Alaska (except for the far Aleutian chain), thus showing our location west of the prime meridian).

Please summarize this section as much as possible in table format!

7. Quality Objectives and Criteria for Measurement of Data –Define the project's overall Data Quality Objectives (DQOs, **EPAQA/G4**). DQOs are qualitative and quantitative statements derived from the DQO Process that:

- Clarify the monitoring objectives (i.e., determine water/wastewater pollutant concentrations of interest and how these values compare to water quality standards regulatory limits
- Define the appropriate type of data needed. In order to accomplish the monitoring objectives, the appropriate type of data needed is defined by the respective WQS. For WQS pollutants, compliance with the WQS is determined by specific measurement requirements. The measurement system is designed to produce water pollutant concentration data that are of the appropriate quantity and quality to assess compliance.

Measurement Quality Objectives (MQOs) are a subset of DQOs. MQOs are derived from the monitoring project's DQOs. MQOs are designed to evaluate and control various phases (sampling, preparation, and analysis) of the measurement process to ensure that total measurement uncertainty is within the range prescribed by the project's DQOs. **MQOs define the acceptable quality (data validity) of field and laboratory data for the project.** MQOs are defined in terms of the following data quality indicators:

- Detectability
- Precision
- Bias/Accuracy
- Completeness
- Representativeness
- Comparability

Detectability is the ability of the method to reliably measure a pollutant concentration above background. DEC DOW uses two components to define detectability: method detection limit (MDL) and practical quantification limit (PQL) or reporting limit (RL).

- The MDL is the minimum value which the instrument can discern above background but no certainty to the accuracy of the measured value. For field measurements the manufacturer's listed instrument detection limit (IDL) can be used.
- The PQL or RL is the minimum value that can be reported with confidence (usually some multiple of the MDL).

Note: The measurement method of choice should at a minimum have a practical quantification limit or reporting limit 3 times more sensitive than the respective DEC WQS and/or permitted pollutant level (for permitted facilities).

Sample data measured below the MDL is reported as ND or non-detect. Sample data measured ≥ MDL but ≤ PQL or RL is reported as estimated data. Sample data measured above the PQL or RL is reported as reliable data unless otherwise qualified per the specific sample analysis.

Precision is the degree of agreement among repeated measurements of the same parameter and provides information about the consistency of methods. Precision is expressed in terms of the relative percent difference between two measurements (A and B).

For field measurements, precision is assessed by measuring replicate (paired) samples at the same locations and as soon as possible to limit temporal variance in sample results. Field and laboratory precision is measured by collecting blind (to the laboratory) field replicate or duplicate samples. For paired and small data sets project precision is calculated using the following formula:

$$\Pr esion = \frac{(A - B)}{(A + B)/2} \times 100$$

For larger sets of paired precision data sets (e.g. overall project precision) or multiple replicate precision data, use the following formula:

RSD = 100*(standard deviation/mean)

Bias (Accuracy) is a measure of confidence that describes how close a measurement is to its "true" value. Methods to determine and assess accuracy of field and laboratory measurements include, instrument calibrations, various types of QC checks (e.g., sample split measurements, sample spike recoveries, matrix spike duplicates, continuing calibration verification checks, internal standards, sample blank measurements (field and lab blanks), external standards), performance audit samples (DMRQA, blind Water Supply or Water Pollution PE samples from A2LA certified, etc. Bias/Accuracy is usually assessed using the following formula:

$$Accuracy = \frac{MeasuredValue}{TrueValue} \times 100$$

Completeness is a measure of the percentage of valid samples collected and analyzed to yield sufficient information to make informed decisions with statistical confidence. As with representativeness, data completeness is determined during project development and specified in

the QAPP. Project completeness is determined for each pollutant parameter using the following formula:

$$\frac{T - (I+NC)}{T} \times (100\%) = \text{Completeness}$$

Where T = Total number of expected sample measurements.
I = Number of invalid sample measured results.
NC = Number of sample measurements not produced (e.g. spilled sample, etc).

Representativeness is determined during project development and specified in the QAPP. Representativeness assigns what parameters to sample for, where to sample, type of sample (grab, continuous, composite, etc.) and frequency of sample collection.

Comparability is a measure that shows how data can be compared to other data collected by using standardized methods of sampling and analysis. ***Comparability is shown by referencing the appropriate measurement method approved by as specified in federal and/or state regulatory and guidance documents/methods for the parameter/s to be sampled and measured*** (e.g., ASTM, Standard Methods, Alaska Water Quality Standards (http://www.dec.state.ak.us/water/wqsar/wqs/index.htm, EPA Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; National Primary Drinking Water Regulations; and National Secondary Drinking Water Regulations; Analysis and Sampling Procedures

http://www.epa.gov/fedrgstr/EPA-WATER/2007/March/Day-12/w1073.htm etc)). As with representativeness and completeness, comparability is determined during project development and must be specified in the QAPP.

For each parameter to be sampled/measured, list the measurement method to be used and the MQOs to meet the overall data quality objectives. This applies to both direct field measurements (e.g., field pH meters, DO meters, etc.) as well as samples collected for subsequent laboratory analyses.

This section is to be presented in table format along with the appropriate WQS numerical value! Please use example table format on following page to present MQO information. In addition a good concise narrative is always helpful.

Example Table: Project Measurement Quality Objectives (MQOs)

Group	Analyte	Method	MDL (µg/L)	PQL (µg/L)	Alaska WQS		Precision (RSD)	Accuracy (% Rec)
					Aquatic Life	Recreation/Drinking Water		
VOCs	Benzene	EPA 602[a]	0.33	1.0	10 µg/l[b]		10	86-126
	Toluene	EPA 602[a]	0.46	1.5			15	52-148
	Ethylbenzene	EPA 602[a]	0.35	1.2			20	60-140
	Xylene, total	EPA 602[a]	0.82	3.0			20	60-140
Settleable Solids	Settleable Solids	EPA 160.5	0.2 ml/L/hr	0.2 ml/L/hr	No measureable increase above natural condition	<5% increase in 0.1 mm to 0.4 mm fine sediment for waters with anadromous fish; <30% by weight of fines in gravel beds	NA	NA
Water Quality	DO	In situ (electronic probe) EPA 360.1	NA	±0.01 mg/L	>4.0 mg/L	>7 mg/l for anadromous fish; >5 mg/l for non-anadromous fish; < 17 mg/L	±20%	NA
	pH	In situ (electronic probe) EPA 150.1	NA	±0.01 pH units	6.5 - 8.5; not vary by 0.5 from natural condition	6.5 - 8.5	±0.1 pH units	±0.1 pH units
	Temperature	In situ (electronic probe) EPA 170.1	NA	0.1°C	<20°C Migration routes < 15°C Spawning areas < 13°C Rearing areas < 15°C Egg /fry incubation < 13°C	<30°C	±0.2°C	±0.2°C
	Conductivity	In situ (electronic probe) EPA 120.1	NA	0-1: 0.001 1-10: 0.01 10-100: 0.1 (mS/cm)	NA	NA	± 10%	± 10%
Total Recoverable Inorganics	Aluminum	EPA200.8	0.33	1.0	750 µg/L Acute; 87 µg/L chronic	NA	20	80-120
	Iron	EPA200.7	2.7	50	NA Acute; 1000 µg/L chronic	NA	20	80-120
	Manganese	EPA 200.8	0.017	0.050	NA	50 µg/L[d]	20	80-120
	Selenium	EPA200.8	0.14	0.50	Fraction Dependent[e]	5.0 µg/L	20	80-120
Dissolved Inorganics	Arsenic	EPA200.8	0.044	0.15	340 µg/L Acute; 150 µg/L chronic	0.018 µg/L	20	80-120
	Cadmium	EPA200.8	0.062	0.20	Hardness Dependent[c]	NA	20	80-120
	Copper	EPA200.8	0.034	0.10	Hardness Dependent[c]	1300 µg/L	20	80-120
	Lead	EPA200.8	0.030	0.10	Hardness Dependent[c]	NA	20	80-120
	Mercury	EPA245.1	0.05	0.2	1.4 µg/L Acute; 0.77 µg/L Chronic	NA	20	80-120
	Zinc	EPA200.8	0.08	0.25	Hardness Dependent[c]	7400 µg/L	20	80-120
Hardness	Hardness	2340B	1000	1000	NA	NA	5	100
Nutrients	Nitrogen, Total Kjeldahl	4500-NH3C	112	400	NA	NA	30	80 - 120
	Total Phosphorous	4500 PE/4500-PB	25.7	51.4	NA	NA	8	80 - 120
Fecal Coliforms	Fecal Coliforms	EPA1604	1cfu/100mL	1cfu/100mL	NA	100 FC/100 mL	5	95 - 105

NA = None available.

[a] EPA Method 602 used for screening BETX. If BTEX measured, confirm with EPA method 624 (GCMS).

[b] Total Aromatic Hydrocarbons are BTEX (Benzene, Toluene, Ethylbenzene, and Xylene) only.

[c] Metal standards for the protection of aquatic life are hardness dependent, the formulas for calculating the appropriate standard are:

	Acute	Chronic	Total to Dissolved onversion Factor
Cadmium	$e^{1.0166(\ln \text{hardness}) - 3.924}$	$e^{0.7409(\ln \text{hardness}) - 4.179}$	1.136672-[(*ln*hardness)(0.041838) for acute 1.101672-[(*ln*hardness)(0.041838) for chronic
Copper	$e^{0.9422(\ln \text{hardness}) - 1.700}$	$e^{0.8545(\ln \text{hardness}) - 1.702}$	0.960 acute and chronic
Lead	$e^{1.273(\ln \text{hardness}) - 1.460}$	$e^{1.273(\ln \text{hardness}) - 4.705}$	1.46203 -[(ln hardness)(0.145712)] for acute 1.46203 -[(ln hardness)(0.145712)] for chronic

8. Special Training/Certifications – This section describes any specialized training or certifications needed by personnel in order to successfully complete the project or task. It should discuss how such training is to be provided and how the necessary skills are assured and documented as well as state how the organization implementing the data collection is qualified and competent. If the project is a research one, it is sufficient to include the resumes of consultants/staff in an appendix.

Please summarize this section as much as possible in table format!

9. Documents and Records – This section *itemizes* all the documents and records that will be produced, such as interim progress reports, final reports, audits, and Quality Assurance Project Plan revisions, etc. It also lists field logs, sample preparation and analysis logs, laboratory analysis, instrument printouts, model inputs and outputs, data from other sources such as databases or literature, the results of calibration and QC checks. Copies of example data sheets should be included in the appendix.

*In addition to any written report, data collected for a project will be submitted electronically to ADEC via a CD ROM, ZIP Disk or email ZIP file. All dates are to be formatted as "**MM-DD-YYYY**".*

Finally this section needs to specify or reference all applicable requirements for the final disposition of records and documents, including location and length of retention period.

Please summarize this section as much as possible in table format!

B. Measurement and Data Acquisition

1. Sampling Process Design - This section includes three major activities:

- Developing and understanding the monitoring objective(s) and appropriate data quality objectives.
- Characterize the general monitoring location/s. Include map providing overview.
- Identifying the site specific sample collection location(s). Include maps with sufficient gradient relief detail, expected pollutant source/s, water bodies, structures and or obstructions affecting sample collection and pollutant contamination, etc!

This section must define the:

- Key parameters to be measured
- Types, numbers and frequency of samples
- Monitoring plan design assumptions,
- When, where and how samples are to be taken, and
- Rational for the monitoring project design.

If the proposed project plan is as a result of previous monitoring efforts, the previous data is to be summarized in table format including parameters and concentrations measured, methods employed and how relate to the Alaska water quality standards criteria. Provide reference to previous data report if available or attach as appendix. Unlike Section 6. Project/Task Description above, the

level of detail here should be sufficient that a person knowledgeable in this area could understand why and how and where the samples are to be taken.

2. Sampling Methods – This section describes the specific procedures for collecting the samples and on-site measurements with **calibrated** field equipment. This section specifies the sampling methods, equipment calibration and maintenance, and specific performance requirements. To establish the basic validity of such monitoring data, it must be shown that:

- The proposed sampling method complies with the appropriate testing regulations.
- The equipment was accurately calibrated using correct and established calibration methods, against standards of known quality, quality control samples to be collected and measured either in-situ or subsequently in a laboratory (sample duplicates/replicates, field blanks, sample splits, and field QC checks to be performed.

Summarize this section as much as possible in table format! Some of this information can be provided by specific reference to existing equipment, sampling and field measurement methods in the appendices. If the referenced SOP, QA/QC manual, etc. is up to date and on file with DEC DOW, provide specific reference as to where these documents reside (DEC DOW program and office).

3. Sample Handling and Custody – This section describes the requirements for sample handling and custody in the field and laboratory, taking into account type and volume of sample collection jars, preservative, the nature of the samples, holding times before extraction and analysis, shipping options and schedules. This information is to be presented in table format. An example table follows:

Example Table: Preservation and Holding Times for the Analysis of Samples

Analyte	Matrix	Container	Necessary Volume	Preservation and Filtration	Maximum Holding Time
Residue (settleable solids)	Surface Water	P, FP, G	1 L	Cool <6°C	48 hours
BTEX	Surface Water	G with FP lined septum	120 mL (3-40mL)	HCl to pH < 2; < 6°C	14 days
Cu, Cd, As, Pb (Dissolved)	Surface Water	P, FP, G	250 mL	Filtered w/in 15 minutes of collection using a 0.45 µm filter; HNO_3 to pH < 2	6 months
Cu, Cd, As, Al, Pb (Total Recoverable)	Surface Water	P, FP, G	250 mL	HNO_3 to pH < 2	6 months
Nitrate-Nitrite	Surface Water	P, FP, G	1 L	Cool <6°C; H_2SO_4 to pH < 2	28 Days
Fecal Coliform	Surface Water	G, PA	250 mL	Cool <10°C; 0.0008% Na_2S2O_3	6 hours 2 hrs lab prep (**note:** time not additive)
Hardness	Surface Water	P, FP, G	100 mL	HNO_3 to pH < 2; < 4°C	6 months

P = polyethylene, FP = flouropolymer, G = glass, PA = autoclavable plastic

If the results of a sampling program may be used as evidence, a strict written record (**Chain of Custody**) must be documented tracking location and possession of the sample/data at all times.

Sample handling/chain of custody forms and associated SOPs, etc. are to be included in the appendices.

4. Analytical Methods – This section provides additional detail on the EPA Approved pollutant methods that will be used to analyze water quality samples in a laboratory (e.g. name and reference number; fecal coliform bacteria 9222D Standard Methods, etc. Specific method identification and name is also previously mentioned in section A7 MQOs Comparability).

Summarize this information in table format! This information can be provided by specific reference to the existing laboratory Quality Assurance Plan and their appropriate Analytical Method Standard Operating Procedure (SOP) if it is up to date and on file with DEC DOW. If referenced, provide specific reference as to where these documents reside (DEC DOW program and office). If not, the analytical lab's current QA Plan and appropriate method SOPs must be included as attachments to the submitted QAPP.
Please summarize this section as much as possible in table format!

5. Quality Control (QC) – QC is the overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements defined by the customer. This section describes the quality control activities that will be used to control the monitoring process to validate sample data. This section must state the frequency, control limits, standards traceability and describe the corrective action(s) to be taken when control limits are exceeded. Quality Control criteria acceptance limits and their frequency of measurement must be summarized in table format for each parameter to be measured. Use separate tables for field QC measurements and Lab QC measurements. These data validation tables define criteria for accepting/rejecting project specific water quality measurement data.

QC Criteria to be listed for field measurements in **Table Format** (but not limited to) are:

- Field blank samples, frequency and acceptance criteria limits.
- QC "calibration" check samples for field measurements, frequency and acceptance criteria limits (e.g., gel turbidity standard independent from turbidity standards used to field calibrate turbidity meter).
- Field duplicate/replicate (precision) samples, frequency and acceptance criteria limits,

An Example field QC table follows:

EXAMPLE TABLE: FIELD QUALITY CONTROL SAMPLES

Quality Control Sample	Measurement Parameter	Frequency		QC Acceptance Criteria Limits
		Frequency of Occurrence	Total # of QC Type Samples	
Field Blank				
Field Duplicate/Replicate				
Trip Blank				
Calibration Verification Check Standard				

QC Criteria to be listed in **Table Format** for field sample collection with subsequent laboratory analyses are (but not limited to):

- Field and laboratory blank samples, frequency and acceptance criteria limits.
- QC "calibration" check standards (e.g., calibration verification and continuing calibration verification check standards), frequency and acceptance criteria limits.
- Field duplicate (precision) samples, frequency and acceptance criteria limits.
- Laboratory replicates, frequency and acceptance criteria limits.
- Laboratory duplicates and matrix spike duplicates, frequency and acceptance criteria limits.

An Example Project QC table follows:

EXAMPLE TABLE: PROJECT QUALITY CONTROL SAMPLES

Quality Control Sample	Measurement Parameter	Frequency		QC Acceptance Criteria Limits
		Frequency of Occurrence	Total # of QC Type Samples	
Field Blank				
Field Duplicate/Replicate Sample				
Trip Blank				
Lab Blank			NA	
Lab Fortified Blank			NA	
Calibration Verification Check Standard			NA	
Continuing calibration verification check			NA	
Matrix Spike/Matrix Spike Duplicate				
External QC Check Standard			NA	
NASurrogate Standard			NA	

6. <u>Instrument/Equipment Testing, Inspection and Maintenance</u> – This section discusses the procedures used to verify that all instruments and equipment are maintained in sound operating condition and are capable of operating at acceptable performance levels. Elements to include in Instrument/Equipment Testing, Inspection and Maintenance documents should include:

- Equipment lists – by monitoring group/station and laboratory
- Spare equipment/parts lists/calibration and QC standards –include suppliers
- Inspection/maintenance frequency – by equipment
- Equipment replacement schedules
- Sources of repair – by equipment
- Service agreements that are in place
- Check sheets and entry forms for documenting testing, inspection, and maintenance performed.
- Acceptance testing must be identified.

Please summarize this section as much as possible in table format!

Appending or referencing approved Standard Operating Procedures is an acceptable way to discuss equipment and sampling kits.

7. Instrument/Equipment Calibration and Frequency – This section identifies the tools, gauges, instruments, and other sampling, measuring and test equipment used for data collection activities affecting quality that must be controlled, and, at specified periods, calibrated to maintain performance within specified limits. It identifies the certified equipment and/or standards used for calibration. It identifies the standards (primary, secondary, etc.), their traceability to known master standards, their certification and expiration dates.

Note: For standards where certification extends over a measurement range (e.g., thermometers, flow meters, etc.), this section also specifies the range these respective standards are traceable over. Please ensure that these standards are appropriate for the measurement range the equipment will be calibrated to and that the calibration range is representative to the environment to be measured.

This section also specifies how records of calibration are to be maintained. Documentation should be readily available for review and should include calibration data, calibration equations, analyzer identification, calibration date, calibration standards used and their traceabilities and the person conducting the calibration. If the laboratory has a current QAP on file with DEC DOW, it may be referenced and provide the name and date of the document and the location where it resides (DEC DOW QA Office, etc). If not, the analytical lab performing project sample analyses must provide a current QAP and respective SOPs to the DEC DOW QA office.

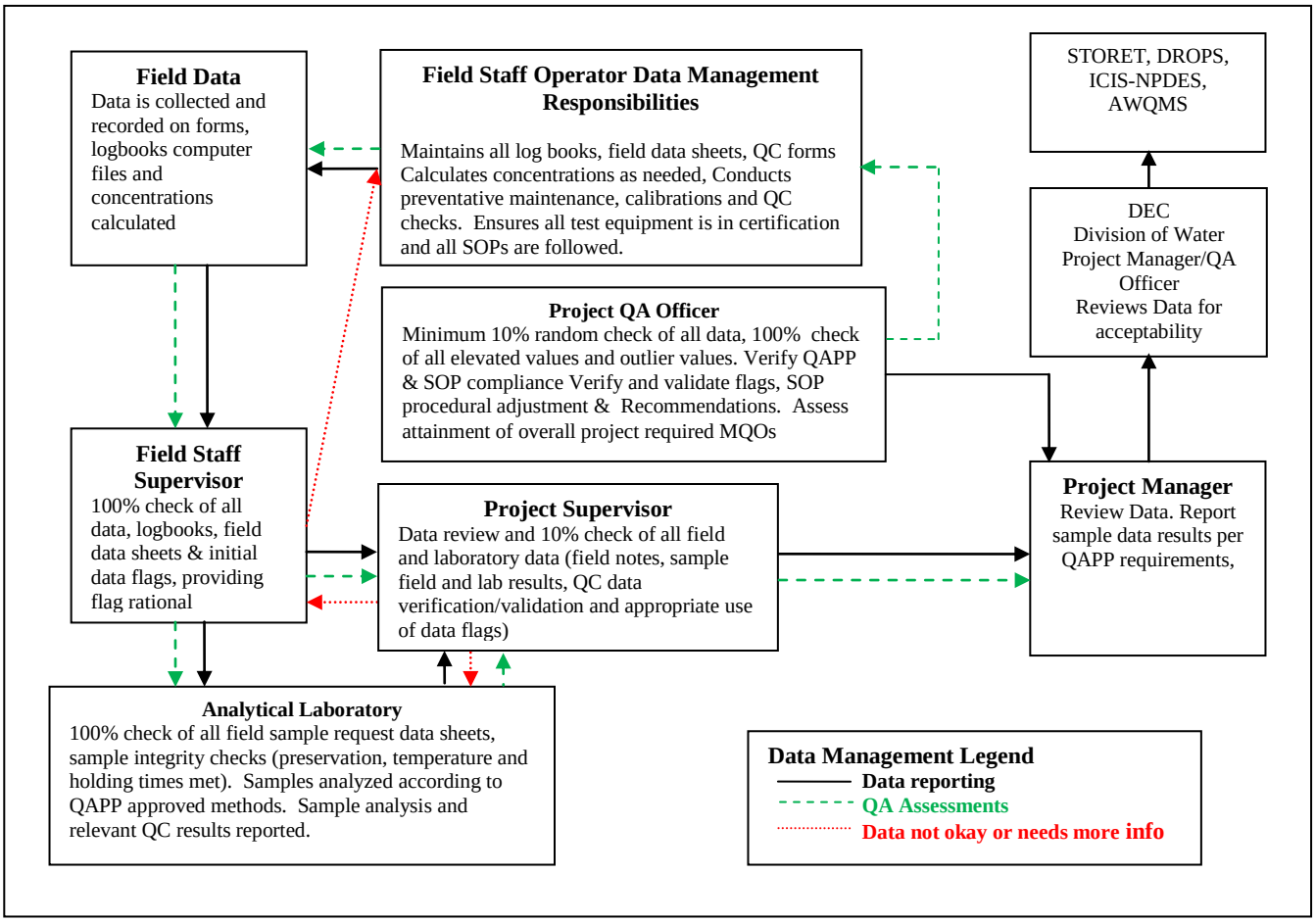
Please summarize this section as much as possible in table format!

8. Inspection/Acceptance of Supplies and Consumables –Describes how and by whom supplies and consumables (e.g. standard materials and solutions, filters, tubing, volumetric glassware, sample bottles, water purity, calibration gases, reagents, calibration standards, electronic data storage media), etc. are inspected and accepted for use in the project. The acceptance criteria should be stated.

9. Non-direct Measurements – This section identifies the type of data needed for project implementation or decision-making that are obtained from non-measurement sources such as maps, charts, GPS latitude/longitude measurements, computer data bases, programs, literature files and historical data bases. It describes the acceptance criteria for the use of such data and specifies any limitations to the use of the data.

10. Data Management – This section describes the project data management process, tracing the path of the data from their generation to their final use or storage (e.g., from field measurements and sample collection/recording, through transfer of data to computers (laptops, data acquisition systems, etc.), laboratory analysis, data validation/verification, QA assessments and reporting of data of known quality to the respective ADEC Division of Water Program Office. It also discusses the control mechanism for detecting and correcting errors. Please include a flow chart as well as detailed narrative of the data management process.

An example data management flow chart follows:


Field Data
Data is collected and recorded on forms, logbooks computer files and concentrations calculated
Field Staff Operator Data Management Responsibilities
Maintains all log books, field data sheets, QC forms Calculates concentrations as needed, Conducts preventative maintenance, calibrations and QC checks. Ensures all test equipment is in certification and all SOPs are followed.
STORET, DROPS, ICIS-NPDES, AWQMS
DEC Division of Water Project Manager/QA Officer Reviews Data for acceptability
Project QA Officer
Minimum 10% random check of all data, 100% check of all elevated values and outlier values. Verify QAPP & SOP compliance Verify and validate flags, SOP procedural adjustment & Recommendations. Assess attainment of overall project required MQOs
Field Staff Supervisor
100% check of all data, logbooks, field data sheets & initial data flags, providing flag rational
Project Supervisor
Data review and 10% check of all field and laboratory data (field notes, sample field and lab results, QC data verification/validation and appropriate use of data flags)
Project Manager
Review Data. Report sample data results per QAPP requirements,
Analytical Laboratory
100% check of all field sample request data sheets, sample integrity checks (preservation, temperature and holding times met). Samples analyzed according to QAPP approved methods. Sample analysis and relevant QC results reported.
Data Management Legend
Data reporting
QA Assessments
Data not okay or needs more info

C. Assessments and Oversight

1. Assessments and Response Actions - This section describes the evaluation processes and criteria used to measure the performance or effectiveness of a quality system. It describes the frequency, numbers and type of project assessments, such as surveillance, peer reviews and audits needed for a specific project.

This section specifies the assessment information expected and the success criteria. It describes how and to whom the results of the assessment are reported and it discusses how response actions to assessment findings, including corrective actions for deficiencies and non-conforming conditions, are to be addressed and by whom. It discusses the process for revising an approved QAPP, if necessary.

For APDES monitoring the permittee is responsible to ensure that any contracted laboratory performing analytical work for the permittee participates annually in a DMRQA blind PT sample for the contracted water/waste water analytes of interest (http://www.nelac-institute.org/PT.php#pab1_4). It is the responsibility of the laboratory to enroll itself in these blind PT studies with the results mailed/emailed directly to the DEC DOW Water Quality Assurance Office.

For water quality monitoring projects where data results are to be compared to water quality standards or other compliance issues, any laboratory performing sample analysis must participate each year in a 3rd party blind Performance Testing (PT) study for water/waste water analyses for the analytical methods of interest (http://www.nelac-institute.org/PT.php#pab1_4). It is the responsibility of the laboratory to enroll itself in these blind PT studies with the results mailed/emailed directly to the DEC DOW Water Quality Assurance Office. Routine laboratory performance in the blind PT sample studies will be used to assess overall laboratory data quality as well as monitoring project data quality. Laboratory performance in routine PT studies evaluate which analytical laboratories are suitable for conducting DEC water quality analytical work.

Microbiological samples must be analyzed by a current DEC EH Drinking Water certified lab (http://www.dec.state.ak.us/eh/lab/certmicrolabs.aspx) for the methods of interest. For those microbiological methods not covered under the DEC EH Lab DW certification program, the microbiological lab will enroll in an approved PT study for the microbiological method of interest (see above link for approved NELAC PT vendors). Laboratory 3rd party microbiological PT samples results will be submitted directly to the DEC Water QA Officer.

Data Quality Assessments

Data quality assessments are statistical and scientific evaluations of the data set to determine the validity and performance of the data collection design and statistical test, and to determine the adequacy of the data set for its intended use. Data Quality Assessments are reported annually and at the end of a project by the QA project manager to the overall project manager. Data

quality assessments are also included in any report to DEC DOW. Each parameter reported will assess the reported data for:

- Completeness,
- Bias, and
- Precision

For definitions, algorithms and Project specified acceptance criteria limits for Completeness, Bias (Accuracy) and Precision, please refer to section A7.

Please summarize this section as much as possible in table format!

2. <u>QA Reports to Management</u> – This section describes the project assessment types, frequency, content, responsible individual/s, and distribution of assessment reports to management and other recipients and actions to be taken.

Please summarize this section as much as possible in table format! An example table follows:

Example Table: QA Reports to Management

QA Report Type	Contents	Presentation Method	Report Issued by	Reporting Frequency		
				As Required	Quarter	Year
Field Performance Audit Reports	Description of audit results, audit methods and standards/equipment used and any recommendations	Written text and charts, graphs displaying results	Project QA Officer/auditor	✔		✔
3rd Party PT (DMRQA,etc.) Audit Report	Description of audit results, methods of analysis and any recommendations	Written text and charts, graphs displaying results	ProjectQA Officer/auditor	✔		✔
Corrective Action Recommendation	Description of problem(s); recommended action(s) required; time frame for feedback on resolution of problem(s)	Written text/table	QA Officer/auditor	✔		
Response to Corrective Action Report	Description of problem(s), description/date corrective action(s) implemented and/or scheduled to be implemented	Written text/table	Project Manager overseeing sampling and analysis	✔		
Data Audit	Independent review and recalculation of sample collection/analysis (including calculations, etc) to determine sample result. Summary of data audit results; findings; and any recommendations	Written text and charts, graphs displaying results	ProjectQA Officer	✔		✔
Quality Assurance Report to Management	Executive summary, precision, bias and system and performance audit results	Written text and charts, graphs displaying results	Project QA Officer	✔		✔

D. Data Validation and Usability

1. <u>Data Review, Validation, & Verification Requirements</u> – The purpose of this section is to state the criteria used to review and validate—that is, accept, reject or qualify data in an objective and consistent manner. It is a way to decide the degree to which each data item has met its quality specifications as described in B above.

Data Validation means determining if data satisfy QAPP-defined user requirements; that is, that the data refer back to the overall data quality objectives. Data validation is an analyte- and sample-specific process that extends the evaluation of data beyond method, procedural, or contractual compliance (i.e., data verification) to determine the analytical quality of a specific data set to ensure that the reported data values meet the quality goals of the environmental data operations (method specific data validation criteria).

Data Verification is the process of evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method, procedural, or contractual requirements.

Data review is the process that evaluates the overall data package to ensure procedures were followed and that reported data is reasonable and consistent with associated QA/QC results.

2. Validation and Verification Methods – This section describes the process for validating and verifying data. It discusses how issues are resolved and identifies the authorities for resolving such issues. It describes how the results are to be conveyed to the data users. This is the section in which to reference examples of QAPP forms and checklists (which could be provided in the appendices). Any project-specific calculations are identified in this section.

3. Reconciliation with User Requirements – The purpose of this section is to outline and specify the acceptable methods for evaluating the results obtained from the project. It includes scientific and statistical evaluations to determine if the data are of the right type, quantity, and quality to support the intended use (i.e. , Did the project's results meet its overall stated DQOs)?

E. Links

For additional assistance in developing a QAPP, refer to:

1) EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5 (http://www.epa.gov/quality/qs-docs/r5-final.pdf);
2) EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5 (http://www.epa.gov/quality/qs-docs/g5-final.pdf);
3) EPA Guidance on Systematic Planning using the Data Quality Objectives Process, EPA QA/G-4 (http://www.epa.gov/QUALITY/qs-docs/g4-final.pdf)